REMARKS

Reconsideration and allowance of this application, as amended, are respectfully requested.

The perpendicular magnetic recording medium defined by claim 24 comprises a nonmagnetic substrate, a first under layer containing titanium, a second under layer containing ruthenium, and a magnetic recording layer containing cobalt. The layers are formed in the order mentioned, and the second under layer and the magnetic recording layer are in contact with the first under layer and the second under layer, respectively.

The second under layer is formed in contact with the first under layer. Therefore, the second under layer is allowed have an improved crystal orientation, and the crystal particles in the second under layer are very small and uniform in diameter. In addition, the magnetic recording medium is formed in contact with this second under layer. This enables the magnetic recording layer to have an improved perpendicular orientation.

The perpendicular magnetic recording medium of claim 37 comprises a magnetic recording layer having a multi-layered structure. The multi-layered structure includes at least two ferromagnetic layers which contain cobalt, platinum and oxygen, and further includes a nonmagnetic layer which contains ruthenium. The magnetic recording layer having this multi-layered structure exhibits further improved perpendicular orientation and perpendicular coercive force.

Honda may disclose a magnetic recording medium which, for example, comprises: an under layer containing titanium, ruthenium, etc.; a first magnetic layer formed on the under layer; a nonmagnetic intermediate layer formed on the first magnetic layer and containing ruthenium, etc.; and a second magnetic layer formed on the nonmagnetic intermediate layer

and having a different lattice constant from that of the first magnetic layer. However, Honda ***does not teach*** the following structures required by our claims:

- ***two under layers*** are provided; and
- the ***second under layer containing ruthenium is formed in contact with the first under layer containing titanium***.

In Futamoto, a first under layer is overlaid with a second under layer. As described in column 9, lines 38-46, however, the lattice constant difference between the second under layer and a magnetic recording layer must be not more than 5%.

As the Examiner has pointed out in item 31 of the Official Action, Futamoto may comprise a magnetic layer formed of CoCrPt alloy, and platinum serves to expand the atomic spacing of cobalt. Chromium has ionic radii similar to those of cobalt and is sold-solubilizable with cobalt when cobalt content is not more than about 30 at%, and a crystal structure of CoPt is not different from that of CoCrPt. It is therefore thought that chromium hardy serves to expand the atomic spacing. In order to use a lattice constant of a CoPt alloy in place of the lattice constant of the CoCrPt alloy and permit that CoPt alloy to maintain an hcp structure, the maximum platinum content should be about 20 at%. Hence, the mismatch between the Co alloy of Futamoto and the ruthenium of Honda can be estimated by calculating the mismatch between a Co-20at%Pt alloy and ruthenium.

The lattice constant of pure cobalt is about 2.71 A, and the shortest atom-to-atom distance of pure platinum is about 2.77A. Therefore, a CoPt alloy containing 80% of cobalt and 20% of platinum has a lattice constant α of 2.56A. Hence, the mismatch between the Co-20at%Pt alloy and ruthenium is calculated as follows:

(2.71-2 56)/2 71 x 100= 5.4 (%)

Since this mismatch is greater than 5%, the ruthenium disclosed in Honda is not applicable to the second under layer of Futamoto.

As should by clear from the foregoing, Futamoto does not disclose using ruthenium in the second under layer, and ruthenium of Honda is not applicable to the second under layer of Futamoto. Hence, our clams 24-27, 29-31 and 40 are patentable.

It is hard to apply the ruthenium of Honda to the second under layer of Futamoto. Even if the magnetic layer of Futamoto is made of a CoPtCrO magnetic layer, or if the magnjetic layer of Honda is made of a CoPtCrO magnetic layer, this does not lead to the structure of claim 28.

Claim 41 recites that the magnetic recording layer has a single-layer structure. Futamoto and Honda disclose a magnetic recording layer having a multi-layered structure (including number of magnetic layers), and under layers used in combination with the magnetic recording layer. Of the magnetic layers constituting the magnetic recording player, the upper magnetic layer is not in contact with the under layers. In contrast, the magnetic layer of the magnetic recording layer of claim 41 is in contact with the under layer, and the magnetic recording layer has a single-layer structure. A magnetic recording medium having a magnetic recording layer of a single-layer structure is described in Examples 1 through 14. The under layer disclosed in Futamoto or Honda cannot be combined with a single magnetic layer. Even if this combination were possible, those skilled in the art could not predict the advantages of the under layer of the present invention. In addition, even if Futamoto and Honda are combined, the combination does not lead to the structure of the present invention (i.e., the magnetic recording layer having a single magnetic layer).

New claims 42 and 43 depend from and further limit the inventions defined by clams 29 and 37, respectively. These new claims recite that even where the magnetic recording layer of the magnetic recording medium has a multi-layered structure including two or more ferromagnetic layers, and that the ferromagnetic layers have the same lattice constant and the same total concentration of an added nonmagnetic element. In our inventions, CoptCrO

magnetic layers having the same characteristics are laminated, with a nonmagnetic layer interposed therebetween, as can be best understood from Example 15 described between page 43, line 10 and page 44, line 7. Our inventions have nothing to do with the technical concept of using magnetic layers of different lattice constants and different concentrations of an added nonmagnetic element.

Claims 42 and 43 are intended to clarify that the magnetic recording layer used in the present invention differs from that disclosed in Futamoto or Honda.

The magnetic layers of Futamoto have different concentrations of an added nonmagnetic element. The magnetic layers of Honda have different lattice constants.

In Futamoto, the lower magnetic layer is made of a Co-17at%Cr-5at%Ta target, and the upper magnetic layer is made of a Co-10at%Cr-10at%Pt target (refer to Example 1 in lines 55-62 of column 11). In Examples 2 through 4 as well, the upper and lower magnetic: layers are different not only in terms of their compositions but also in terms of their nonmagnetic elements.

Claim 44 recites that the nonmagnetic layer contains palladium. None of the references disclose a nonmagnetic layer that contains palladium.

In view of the foregoing, the claims, as now presented, are believed to be in form for allowance, and such action is hereby solicited. If any point remains in issue which the Examiner feels may be best resolved through a personal or telephone interview, please contact the undersigned at the telephone number listed below.

All objections and rejections having been addressed, it is respectfully submitted that the present application is in a condition for allowance and a Notice to that effect is earnestly solicited.

Respectfully submitted,

Pillsbury Winthrop, LLP

By: _____

Glenn J. Perry
Reg. No.: 28,458
Telephone: (703) 905-2161
Direct Fax: (703) 738-2277

Pillsbury Winthrop, LLP
1600 Tysons Boulevard
McLean, Virginia 22102

Switchboard: (703) 905-2000
Office fax: (703) 905-2500